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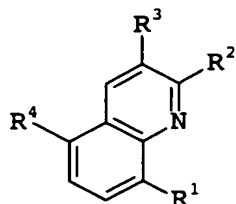
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We claim:

1. A cyclohexenonequinolinoyl derivative of the formula I



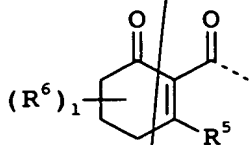
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where:

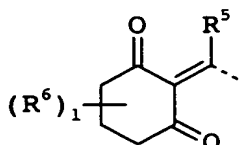
R^1 is hydrogen, nitro, halogen, cyano, C_1-C_6 -alkyl, C_1-C_6 -haloalkyl, C_1-C_6 -alkoxyiminomethyl, C_1-C_6 -alkoxy, C_1-C_6 -haloalkoxy, C_1-C_6 -alkylthio, C_1-C_6 -haloalkylthio, C_1-C_6 -alkylsulfinyl, C_1-C_6 -haloalkylsulfinyl, C_1-C_6 -alkylsulfonyl, C_1-C_6 -haloalkylsulfonyl, aminosulfonyl, $N-(C_1-C_6-alkyl)aminosulfonyl$, $N,N-di-(C_1-C_6-alkyl)aminosulfonyl$, $N-(C_1-C_6-alkylsulfonyl)amino$, $N-(C_1-C_6-haloalkylsulfonyl)amino$, $N-(C_1-C_6-alkyl)-N-(C_1-C_6-alkylsulfonyl)amino$, $N-(C_1-C_6-alkyl)-N-(C_1-C_6-haloalkylsulfonyl)amino$, phenoxy, heterocyclyloxy, phenylthio or heterocyclylthio, where the four last-mentioned radicals may be partially or fully halogenated and/or may carry one to three of the following substituents: nitro, cyano, C_1-C_4 -alkyl, C_1-C_4 -haloalkyl, C_1-C_4 -alkoxy or C_1-C_4 -haloalkoxy;

R^2, R^3 are hydrogen, C_1-C_6 -alkyl, C_1-C_6 -haloalkyl or halogen;

R^4 is a compound IIa or IIb



IIa



IIb

where

R⁵

is halogen, OR⁷, SR⁷, SOR⁸, SO₂R⁸, OSO₂R⁸, POR⁸R⁹, OPR⁸R⁹, OPOR⁸R⁹, OPSR⁸R⁹, NR¹⁰R¹¹, ONR¹¹R¹², N-linked heterocyclyl or O-(N-linked heterocyclyl), where the heterocyclyl radical of the two last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:

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nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy;

R⁶

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is nitro, halogen, cyano, C₁-C₆-alkyl, C₁-C₆-haloalkyl, di-(C₁-C₆-alkoxy)methyl, di-(C₁-C₆-alkylthio)methyl, (C₁-C₆-alkoxy)(C₁-C₆-alkylthio)methyl, hydroxyl, C₁-C₆-alkoxy, C₁-C₆-haloalkoxy, C₁-C₆-alkoxycarbonyloxy, C₁-C₆-alkylthio, C₁-C₆-haloalkylthio, C₁-C₆-alkylsulfinyl, C₁-C₆-haloalkylsulfinyl, C₁-C₆-alkylsulfonyl, C₁-C₆-haloalkylsulfonyl, C₁-C₆-alkylcarbonyl, C₁-C₆-haloalkylcarbonyl, C₁-C₆-alkoxycarbonyl or C₁-C₆-haloalkoxycarbonyl;

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or

two radicals R⁶, which are linked to the same carbon, together form an -O-(CH₂)_m-O-, -O-(CH₂)_m-S-, -S-(CH₂)_m-S-, -O-(CH₂)_n- or -S-(CH₂)_n chain which may be substituted by one to three radicals from the following group: halogen, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl or C₁-C₄-alkoxycarbonyl;

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or

two radicals R⁶, which are linked to the same carbon, together form a -(CH₂)_p chain which may be interrupted by oxygen or sulfur and/or may be substituted by one to four radicals from the following group: halogen, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl or C₁-C₄-alkoxycarbonyl;

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or

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two radicals R^6 , which are linked to the same carbon, together form a methylenide group which may be substituted by one or two radicals from the following group:

halogen, hydroxyl, formyl, cyano, C_1 - C_6 -alkyl, C_1 - C_6 -haloalkyl, C_1 - C_6 -alkoxy, C_1 - C_6 -haloalkoxy, C_1 - C_6 -alkylthio, C_1 - C_6 -haloalkylthio, C_1 - C_6 -alkylsulfinyl, C_1 - C_6 -haloalkylsulfinyl, C_1 - C_6 -alkylsulfonyl or C_1 - C_6 -haloalkylsulfonyl;

or

two radicals R^6 , which are linked to the same carbon, together with this carbon form a carbonyl group;

or

two radicals R^6 , which are linked to different carbons, together form a $-(CH_2)_n$ chain which may be substituted by one to three radicals from the following group:
halogen, C_1 - C_6 -alkyl, C_1 - C_6 -alkoxy, hydroxyl or C_1 - C_6 -alkoxycarbonyl;

R^7 is C_1 - C_6 -alkyl, C_3 - C_6 -alkenyl, C_3 - C_6 -haloalkenyl, C_3 - C_6 -alkynyl, C_3 - C_6 -haloalkynyl, C_3 - C_6 -cycloalkyl, C_1 - C_{20} -alkylcarbonyl, C_2 - C_6 -alkenylcarbonyl, C_2 - C_6 -alkynylcarbonyl, C_3 - C_6 -cycloalkylcarbonyl, C_1 - C_6 -alkoxycarbonyl, C_3 - C_6 -alkenyloxycarbonyl, C_3 - C_6 -alkynyloxycarbonyl, $(C_1$ - C_{20} -alkylthio)carbonyl, C_1 - C_6 -alkylaminocarbonyl, C_3 - C_6 -alkenylaminocarbonyl, C_3 - C_6 -alkynylaminocarbonyl, N,N -di- $(C_1$ - C_6 -alkyl)aminocarbonyl, N -(C_3 - C_6 -alkenyl)- N -(C_1 - C_6 -alkyl)aminocarbonyl, N -(C_3 - C_6 -alkynyl)- N -(C_1 - C_6 -alkyl)aminocarbonyl, N -(C_1 - C_6 -alkoxy)- N -(C_1 - C_6 -alkyl)aminocarbonyl, N -(C_3 - C_6 -alkenyl)- N -(C_1 - C_6 -alkoxy)aminocarbonyl, N -(C_3 - C_6 -alkynyl)- N -(C_1 - C_6 -alkoxy)aminocarbonyl, di- $(C_1$ - C_6 -alkyl)-aminothiocarbonyl, C_1 - C_6 -alkylcarbonyl- C_1 - C_6 -alkyl, C_1 - C_6 -alkoxyimino- C_1 - C_6 -alkyl, N -(C_1 - C_6 -alkylamino)imino- C_1 - C_6 -alkyl or N,N -di- $(C_1$ - C_6 -alkylamino)imino- C_1 - C_6 -alkyl, where the abovementioned alkyl, cycloalkyl and alkoxy radicals may be partially or fully halogenated

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and/or may carry one to three of the following groups:

cyano, C₁-C₄-alkoxy, C₁-C₄-alkylthio, di-(C₁-C₄-alkyl)amino, C₁-C₄-alkylcarbonyl, C₁-C₄-alkoxycarbonyl, C₁-C₄-alkoxy-C₁-C₄-alkoxycarbonyl, di-(C₁-C₄-alkyl)amino-C₁-C₄-alkoxycarbonyl, hydroxycarbonyl, C₁-C₄-alkylaminocarbonyl, di-(C₁-C₄-alkyl)aminocarbonyl, aminocarbonyl, C₁-C₄-alkylcarbonyloxy or C₃-C₆-cycloalkyl;

phenyl, heterocyclyl, phenyl-C₁-C₆-alkyl, heterocyclyl-C₁-C₆-alkyl, phenylcarbonyl-C₁-C₆-alkyl, heterocyclylcarbonyl-C₁-C₆-alkyl, phenylcarbonyl, heterocyclylcarbonyl, phenoxycarbonyl, heterocycliloxy carbonyl, phenoxythiocarbonyl, heterocycliloxythiocarbonyl, phenoxy-C₁-C₆-alkylcarbonyl, heterocycliloxy-C₁-C₆-alkylcarbonyl, phenylaminocarbonyl, N-(C₁-C₆-alkyl)-N-(phenyl)aminocarbonyl, heterocyclylaminocarbonyl, N-(C₁-C₆-alkyl)-N-(heterocyclyl)aminocarbonyl, phenyl-C₂-C₆-alkenylcarbonyl or heterocyclyl-C₂-C₆-alkenylcarbonyl, where the phenyl and the heterocyclyl radical of the 20 last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals: nitro, cyano, C₁-C₄-alkyl, C₁-C₄-halogenalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy;

R⁸, R⁹

are C₁-C₆-alkyl, C₃-C₆-alkenyl, C₃-C₆-haloalkenyl, C₃-C₆-alkynyl, C₃-C₆-haloalkynyl, C₃-C₆-cycloalkyl, hydroxyl, C₁-C₆-alkoxy, amino, C₁-C₆-alkylamino, C₁-C₆-haloalkylamino, di-(C₁-C₆-alkyl)amino or di-(C₁-C₆-haloalkyl)amino, where the abovementioned alkyl, cycloalkyl and alkoxy radicals may be partially or fully halogenated and/or may carry one to three of the following groups: cyano, C₁-C₄-alkoxy, C₁-C₄-alkylthio, di-(C₁-C₄-alkyl)amino, C₁-C₄-alkylcarbonyl, C₁-C₄-alkoxycarbonyl, C₁-C₄-alkoxy-C₁-C₄-alkoxycarbonyl, di-(C₁-C₄-alkyl)amino-C₁-C₄-alkoxycarbonyl,

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hydroxycarbonyl, C₁-C₄-alkylaminocarbonyl, di-(C₁-C₄-alkyl)aminocarbonyl, aminocarbonyl, C₁-C₄-alkylcarbonyloxy or C₃-C₆-cycloalkyl;

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phenyl, heterocyclyl, phenyl-C₁-C₆-alkyl, heterocyclyl-C₁-C₆-alkyl, phenoxy, heterocycliloxy, where the phenyl and the heterocyclyl radical of the last-mentioned substituents may be partially or fully halogenated and/or may carry one to three

of the following radicals:
nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy;

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R¹⁰

is C₁-C₆-alkyl, C₃-C₆-alkenyl, C₃-C₆-haloalkenyl, C₃-C₆-alkynyl, C₃-C₆-haloalkynyl, C₃-C₆-cycloalkyl, hydroxyl, C₁-C₆-alkoxy, C₃-C₆-alkenyloxy, C₃-C₆-alkynyloxy, amino, C₁-C₆-alkylamino, di-(C₁-C₆-alkyl)amino or C₁-C₆-alkylcarbonylamino, where the abovementioned alkyl, cycloalkyl and alkoxy radicals may be partially or fully halogenated and/or may carry one to three radicals from the following group:

20

cyano, C₁-C₄-alkoxy, C₁-C₄-alkylthio, di-(C₁-C₄-alkyl)amino, C₁-C₄-alkylcarbonyl, C₁-C₄-alkoxycarbonyl,

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C₁-C₄-alkoxy-C₁-C₄-alkoxycarbonyl, di-(C₁-C₄-alkyl)amino-C₁-C₄-alkoxycarbonyl, hydroxycarbonyl, C₁-C₄-alkylaminocarbonyl, di-(C₁-C₄-alkyl)aminocarbonyl, aminocarbonyl, C₁-C₄-alkylcarbonyloxy or C₃-C₆-cycloalkyl;

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phenyl, heterocyclyl, phenyl-C₁-C₆-alkyl or heterocyclyl-C₁-C₆-alkyl, where the phenyl or heterocyclyl radical of the four last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:

nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy;

40

R¹¹, R¹²

are C₁-C₆-alkyl, C₃-C₆-alkenyl, C₃-C₆-alkynyl or C₁-C₆-alkylcarbonyl;

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is 0 to 6;

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m

is 2 to 4;

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n is 1 to 5;

p is 2 to 5;

5 and their agriculturally useful salts.

2. A cyclohexenonequinolinoyl derivative of the formula I as claimed in claim 1, where

10 R¹ is halogen, C₁-C₆-alkyl, C₁-C₆-haloalkyl, C₁-C₆-alkoxy, C₁-C₆-alkylthio, heterocyclyloxy or phenylthio, where the two last-mentioned radicals may be partially or fully halogenated and/or may carry one to three of the substituents mentioned below:

15 nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy;

20 R⁵ is halogen, OR⁷, SR⁷, SOR⁸, SO₂R⁸, OSO₂R⁸, OPR⁸R⁹, OPOR⁸R⁹, OPSR⁸R⁹, NR¹⁰R¹¹ or N-bonded heterocyclyl which may be partially or fully halogenated and/or may carry one to three of the following radicals: nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy.

25 3. A cyclohexenonequinolinoyl derivative of the formula I as claimed in claim 1 or 2, where

30 R⁵ is halogen, OR⁷, NR¹⁰R¹¹ or N-bonded heterocyclyl which may be partially or fully halogenated and/or may carry one to three of the following radicals: nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy.

35 4. A cyclohexenonequinolinoyl derivative of the formula I as claimed in claims 1 to 3, where

40 R⁷ is C₁-C₆-alkyl, C₁-C₂₀-alkylcarbonyl, C₁-C₆-alkoxycarbonyl, (C₁-C₂₀-alkylthio)carbonyl, N,N-di-(C₁-C₆-alkyl)aminocarbonyl, phenyl, phenylcarbonyl or phenoxy-C₁-C₆-alkylcarbonyl, where the phenyl radical of the three last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals: nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy or C₁-C₄-haloalkoxy;

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R¹⁰ is C₁-C₆-alkyl or C₁-C₆-alkoxy;

R¹¹ is C₁-C₆-alkyl.

- 5 5. A cyclohexenonequinolinoyl derivative of the formula I as claimed in claims 1 to 4, where

R⁶ is nitro, halogen, cyano, C₁-C₆-alkyl, C₁-C₆-haloalkyl, di-(C₁-C₆-alkoxy)methyl, di-(C₁-C₆-alkylthio)methyl, (C₁-C₆-alkoxy)(C₁-C₆-alkylthio)-methyl, hydroxyl, C₁-C₆-alkoxy, C₁-C₆-haloalkoxy, C₁-C₆-alkoxycarbonyloxy, C₁-C₆-alkylthio, C₁-C₆-haloalkylthio, C₁-C₆-alkylsulfinyl, C₁-C₆-haloalkylsulfinyl, C₁-C₆-alkylsulfonyl, C₁-C₆-haloalkylsulfonyl, C₁-C₆-alkylcarbonyl, C₁-C₆-haloalkylcarbonyl, C₁-C₆-alkoxycarbonyl or C₁-C₆-haloalkoxycarbonyl;

or

two radicals R⁶, which are linked to the same carbon, together form an -O-(CH₂)_m-O-, -O-(CH₂)_m-S-, -S-(CH₂)_m-S-, -O-(CH₂)_n- or -S-(CH₂)_n chain which may be substituted by one to three radicals from the following group: halogen, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl or C₁-C₄-alkoxycarbonyl;

or

two radicals R⁶, which are linked to the same carbon, together form a -(CH₂)_p chain which may be interrupted by oxygen or sulfur and/or may be substituted by one to four radicals from the following group: halogen, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl or C₁-C₄-alkoxycarbonyl;

or

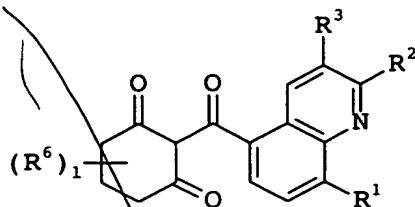
two radicals R⁶, which are linked to the same carbon, together with this carbon form a carbonyl group.

6. A process for preparing compounds of the formula I as claimed in claims 1 to 5 where R⁵ = halogen, which comprises reacting a cyclohexanedione derivative of the formula III,

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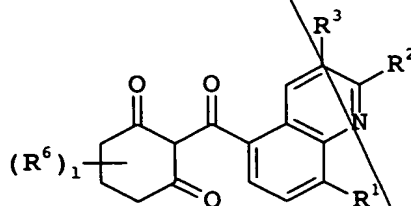
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III

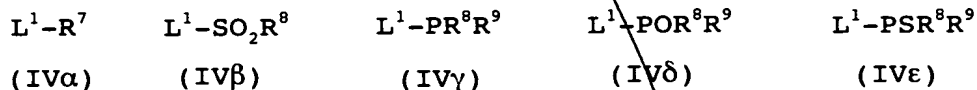
where the variables R^1 to R^3 , R^6 and l are each as defined in claims 1 to 5, with a halogenating agent.

7. A process for preparing compounds of the formula I as claimed in claims 1 to 5 where $R^5 = OR^7$, OSO_2R^8 , OPR^8R^9 , $OPOR^8R^9$ or $OPSR^8R^9$, which comprises reacting a cyclohexanedione derivative of the formula III,



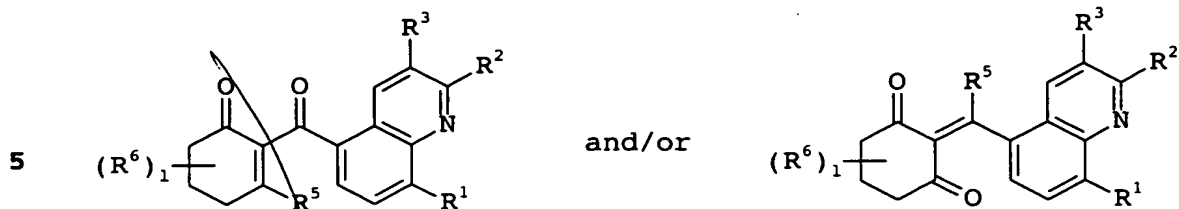
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where the variables R^1 to R^3 , R^6 and l are each as defined in claims 1 to 5, with a compound of the formula $IV\alpha$, $IV\beta$, $IV\gamma$, $IV\delta$ or $IV\epsilon$,



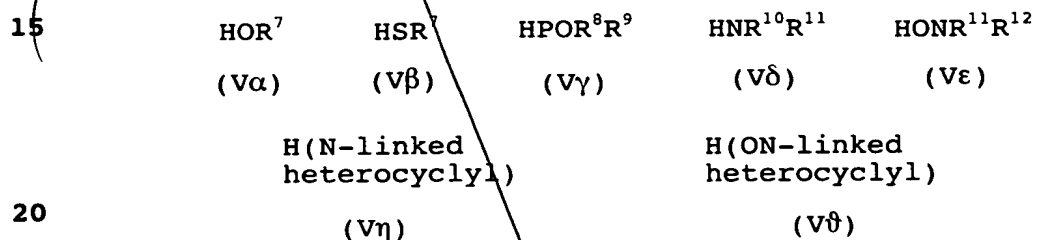
where the variables R^7 to R^9 are each as defined in claims 1 to 5 and L^1 is a nucleophilically replaceable leaving group.

8. A process for preparing compounds of the formula I as claimed in claims 1 to 5 where $R^5 = OR^7$, SR^7 , POR^8R^9 , $NR^{10}R^{11}$, $ONR^{11}R^{12}$, N-linked heterocyclyl or O-(N-linked heterocyclyl), which comprises reacting a compound of the formula Ia ($= I$ where $R^5 = \text{halogen, } OSO_2R^8$),



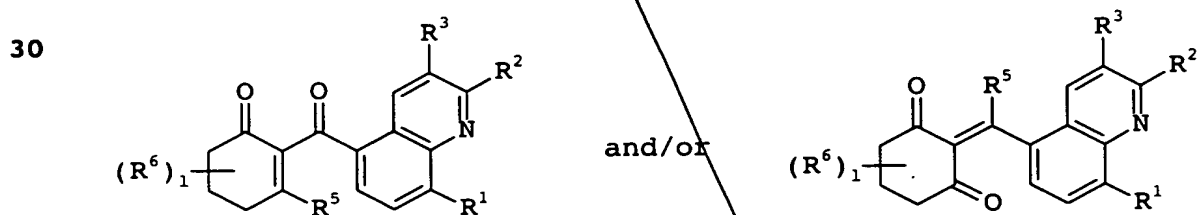
I where $R^5 = \text{halogen or } \text{OSO}_2R^8$

10 where the variables R^1 to R^3 , R^6 and l are each as defined in claims 1 to 5, with a compound of the formula $V\alpha$, $V\beta$, $V\gamma$, $V\delta$, $V\epsilon$, $V\eta$ or $V\theta$,



where the variables R^7 to R^{12} are each as defined in claims 1 to 5, if appropriate in the presence of a base.

- 25 9. A process for preparing compounds of the formula I as claimed in claims 1, 2 or 5, where $R^5 = \text{SOR}^8$, SO_2R^8 , which comprises reacting a compound of the formula $I\beta$ ($= I$ where $R^5 = \text{SR}^8$),



35 I where $R^5 = \text{SR}^8$

40 where the variables R^1 to R^8 and l are each as defined in claims 1, 2 or 5, with an oxidizing agent.

- 45 10. A composition, comprising a herbicidally effective amount of at least one cyclohexenonequinolinoyl derivative of the formula I or an agriculturally useful salt of I as claimed in claims 1 to 5 and auxiliaries which are customarily used for formulating crop protection agents.

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- 5 11. A process for preparing compositions as claimed in claim 10, which comprises mixing a herbicidally effective amount of at least one cyclohexenonequinolinoyl derivative of the formula I or an agriculturally useful salt of I as claimed in claims 1 to 5 and auxiliaries which are customarily used for formulating crop protection agents.
- 10 12. A method for controlling undesirable vegetation, which comprises allowing a herbicidally effective amount of at least one cyclohexenonequinolinoyl derivative of the formula I or an agriculturally useful salt of I as claimed in claims 1 to 5 to act on plants, their habitat and/or on seeds.
- 15 13. The use of cyclohexenonequinolinoyl derivatives of the formula I or their agriculturally useful salts as claimed in claims 1 to 5 as herbicides.
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